ZWERM: stimulating urban neighborhood self-organization through gamification

Tanguy Coenen, iMinds – iLab.o – SMIT – Vrije Universteit Brussel

Peter Mechant, iMinds – MICT – Universiteit Gent

Thomas Laureyssens, MAD Faculty – LUCA School of Arts / KU Leuven

Laurence Claeys, Vrije Universiteit Brussel

Johan Criel, Bell-Labs – Alcatel-Lucent

Introduction

This paper investigates how self-organization can be supported at the level of the urban neighborhood, based on the interactions of neighborhood inhabitants using a prototyped and implemented social computing application called ZWERM[1]. According to Vasileva (2012), "Social Computing Applications" (SCA) allow users to discuss various topics in online forums, share their thoughts in blogs, share photos, videos, bookmarks, and connect with friends through social networks." (Vasileva, 2012, p178). From the description, we can infer that SCA is a very similar concept to what is often called social media. Many initiatives exist that try to get people to know each other and do things together at the local level, but the number of *digital* systems that aim for this is limited. Even fewer are the systems that try to support self-organization.

Heylighen et al (in presss) introduces the concept of the "mobilization system", which can be defined as: "a socio-technological system that motivates and coordinates people to work towards a given objective" (Heylighen et al in press, p2). In this definition, the elements of coordination and motivation are important. Heylighen (2012) mentions amongst others gamification as an approach to create mobilization systems. From a societal point of view, such a system should act under the principle of *libertarian paternalism,* inciting people to do what is good for the collective, without law enforcement

The focus of this paper is on how to support local self-organization in urban neighborhoods through a SCA mobilization system that uses gamification. To achieve this, two main objectives were put forward. Firstly, people should get to know each other. This is what we refer to as consolidating social capital. Secondly, this social capital should be made to act as the basis on which action can be undertaken. This is what we mean when we refer to the activation of social capital.

Combining the above, the paper addresses the following central research question: *"How can both the activation and the consolidation of social capital be achieved through the coordination and motivation elements that are typically found in mobilization systems built as social computing applications, in order to stimulate self-organization in urban neighborhoods?"*

[1] ZWERM is Dutch for 'swarm'

ZWERM

ZWERM is a city intervention that uses a mobilization system to reach the goal of consolidating and activating social capital. By interacting with ZWERM, people should get to know each other and undertake action together that is beneficial for the collective. It is through these actions that self-organization can be supported.

The ZWERM city intervention took place in two neigborhoods (called 'Papegaai' and 'Ekkergem') in the city of Ghent in Belgium. The ZWERM concept was developed in collaboration with multiple stakeholders including personnel from the City of Ghent and city's inhabitants. More than 250 people from the selected neighborhoods 'Papegaai' and 'Ekkergem' actively participated in ZWERM. Preliminary evaluation results show that ZWERM was greatly appreciated by the players. More than 80% of the players stated that ZWERM helped them to get to know the people in their neighborhood better, while more than 75% stated that ZWERM induced a sense of community and improved neighborhood cohesion.

Methodology

The development of ZWERM has been a scientific, design, technical and user-driven process[2]. We define our methodology as a design-led action research with a focus on transferability. Action research was initiated and still is widely used in social sciences as a research method where changes in society are aimed for. But action research has also been used widely and successfully in the human-computer interaction (HCI) research area. However, in this discipline it focuses mostly on transferability rather than on generalizability (Hayes, 2012). The latter is the main focus of most academic social sciences research approaches of action research. In both disciplines, action research follows a cyclic approach in which interventions are designed based on stakeholder requirements, developed, tested/put in the field, evaluated and refined. The ZWERM system has been created along these lines.

In a first phase, a crowdsourcing ideation effort was conducted among the citizens of Ghent to gather ideas on possible ideas for applications to be developed within the scope of the project[3] (also see Mechant et al., 2012), around the broad topic of citizen engagement. Based on the ensuing list of ideas, co-design sessions were conducted. This was first done with a broad stakeholder group representing citizens of Ghent. Then, more focused co-design sessions were held around a first design idea with inhabitants of the neighborhood in which the system was to be deployed.

This allowed us to create a first software prototype, which we tested in the safe environment of our own research department. Around 40 researchers participated in the test. Based on the technical and functional insights we derived from this, a new version was created and deployed in the city of Ghent. This, at the time of writing most recent prototype, is what we refer to as ZWERM. The functioning of the system and the data we gathered from the evaluation of ZWERM is what we report on in this paper. The outcomes

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[2] People from different disciplines were involved in the development of ZWERM: designers, engineers, social scientists, policy-makers and end-users. In this article we only describe the process we went through with end-users, not with the team of researchers.

3 EU-CIP project SMARTiP (Smart Metropolitan Areas Realised Through Innovation & People www.smart-ip.eu).

are insights in the design of mobilization systems built as SCA for the support of self-organization in urban neighborhoods. Following the action research logic described above, these insights are more transferrable than they are generalizable.

Gamification

The most used definition of gamification is by Deterding et al (2011): “Gamification is the use of game design elements in non-game contexts”. The attention to the gamification and gameful design phenomenon has grown tremendously in the last 3 years (e.g. McGonigal 2011, Zichermann 2011), originating more from web design and gaming developers and consultants than from academics. The idea driving the application of gamification is that it is possible to apply the elements that motivate people to play games to other domains, like for example organizational productivity or improving one’s health.

Gamification has its proponents (e.g. McGonigal 2011, Zichermann 2011) and opponents (e.g. Bogost 2011, Robertson 2010). Judd (2012) sees gamification as a positive trend, but agrees with Robertson (2010) that many current examples of gamified systems do a poor job. They fail to apply the real value of points systems and badges, which are more related to social psychology. For example, badges produce reputation, which is a greater motivator that just collecting additional badges for the sake of it. Judd (2012) sees gamification as a trend, that should be followed up on to make systems more engaging, supportive and satisfying.

Paharia (2012) points out that the service being gamified needs to provide some value of its own to its user. If this is not the case, no amount of gamification will make the system a success. However, if the service does provide intrinsic value, gamification can amplify this value, potentially increasing the uptake of the service. Paharia stresses that gamification is a design problem, that should be addressed using design thinking and design processes.

When gamifying a system, design methods from game design can be applied to non-game contexts. The game design literature presents us with a number of frameworks to base ourselves on, like Schell’s (2009) design lenses or Hunicke et al’s (2004) MDA framework. We base ourselves on the latter.

The MDA framework is composed of <u>m</u>echanics, <u>d</u>ynamics and <u>a</u>esthetics. Mechanics refer to the components of the game that the player can interact with, like shooting an adversary using a mouse-controlled interface. Dynamics are the intricate behaviors that are created by the mechanics as a result of player input, like aiming for a player’s head to score a “head shot”. Aesthetics are the feelings that the player will go through when experiencing the game, like a triumphant feeling when scoring a head shot. Hunicke et al (2004) frame it as follows:

“From the designer’s perspective, the mechanics give rise to dynamic system behavior, which in turn leads to particular aesthetic experiences. From the player’s perspective, aesthetics set the tone, which is born out in observable dynamics and eventually, operable mechanics.” (Hunicke et al 2004 p2)

As was already said, the MDA framework was created for application to the game design domain. However, most games have only one goal, which is to entertain the players. This is no longer the case for serious games and gamified systems, where game elements are a means to an end and where the end is something other than mere entertainment. This end or goal is not part of the MDA framework, but is important in order to fully describe systems like ZWERM. We therefore propose to call the framework MDAG (mechanics, dynamics, aesthetics, goals). The goals in MDAG are then supported by the aesthetics of the system, which in turn are generated by the dynamics that are produced by the system's mechanics. We will now explain the different components of ZWERM according to the MDAG framework.

Goals

The goals we set out when designing and building ZWERM were to consolidate and activate social capital. This meant that we wanted to get people to know each other and to undertake action together that was beneficial for the collective. It is through these actions that self-organization can be supported. The consolidation of social capital provides the basis on which self-organization can build, while the activation of social capital provides the aesthetics, dynamics and mechanics that can guide self-organization.

Aesthetics

Hunicke et al (2004) have described a list of 8 common aesthetics, which they say is not exhaustive: sensation, fantasy, narrative, challenge, fellowship, discovery, expression and submission/pastime. ZWERM mainly focused on fellowship, challenge, pastime and expression.

Fellowship

Fellowship, described by Hunicke et al (2004) as "the game as a social framework" is an essential experience that we aimed for in ZWERM. The system was inherently social and getting people to know each other was one of the goals we set out. However, our aim was to go further than common social networking systems like Facebook and Twitter. Most SCA, except dating sites, reflect the face-to-face social network of the user. These systems are very useful for keeping established social relationships alive (Ellison et al, 2007), but do not generate great numbers of new relationships. Feld (1986) found that people's social networks mainly grow through offline contacts that are formed around foci, where a focus is "a social, psychological, legal or physical entity around which joint activities are organized. […] Foci can be many different things, including persons, places, social positions, activities and groups." (Feld 1986, p1016 & 1018). In ZWERM, we choose to follow a strategy where people would have better chances of getting to know each other by using the system. Feld's foci indicate that this is more likely to happen face-to-face than online.

Challenge

Challenge was another important aesthetic. We wanted to create challenges that would have a beneficial effect for the neighborhood. It was through the creation of challenges that we wanted to achieve the activation of social capital and by the same token support self-organization. We aimed to achieve this by creating a number of assignments types, acting as general templates that could be used to create concrete assignments. The list of assignment types was extensible, allowing people with the correct permissions in the system to easily create new assignment types and in doing so introduce new challenges.

Pastime

Submission is described by Hunicke et al (2004) as "the game as pastime". Because submission sounds rather aggressive, we prefer to refer to this type of aesthetic as pastime. ZWERM was designed to be something that would not require a large time effort to play and that would fit in the daily lives of most neighborhood inhabitants without being too intrusive. This, we believed, could be more conductive to a user experience that would be sustained over a number of weeks. Whenever the player had some time, she could choose to engage with one of the ZWERM game mechanics. In our choice for the pastime aesthetic, ZWERM is in line with the currently popular category of casual games (e.g. Angry birds, Tap Tap revenge, Clash of Clans) for smartphones and tablets.

Expression

We also wanted people to be able to express themselves through ZWERM, as self-expression can be a motivating element for people to undertake communal actions. We leveraged the challenge aesthetic to act as a call to action for people to express themselves in a diverse number ways. These calls to action were distributed in the form of the assignments and yielded a large and varied number of self-organized behavior outcomes, such as poster designs of ZWERM, organization modes for performing check-ins, online maps of the neighborhood representing certain interesting places or different types of opinions regarding specific issues in the neighborhood.

Mechanics

Now that we have described the goals and aesthetics of the system, we turn to the actual building blocks of the system: the mechanics. In terms of linear description of the MDAG framework, it would have been more consequent to first describe the dynamics. Yet we feel that these are hard to explain without first discussing the mechanics that produce these dynamics. Also, a word must first be said on user roles. The player role, performed by neighborhood inhabitants, was not the only role in the ZWERM system. The community coach role was also very important, from a self-organizational perspective. Community coaches had special permissions in the system and could for example create assignment content. It is through these assignments that self-organization can be guided. In our trials, the community coaches were people from Ghent's city administration. It is important that assignment content is created by people who are as close as possible to the participating neighborhoods, in order to create assignments that will interest and motivate the players.

Score

Scoring points is an important mechanic in many games and gamified systems. Points allow the user to progress in the game, to engage in status building and to compete with others. In ZWERM, all the different activities that could be undertaken would increase points on a personal and/or on a team level. The system was built in such a way that the server could be addressed using a REST API. In this way, new and loosely coupled applications can be built, of which certain activities add points to the system. We demonstrated this ability by creating a mobile check-in system for events. Participating in an event allowed the user to check-in using an RFID card and a tablet computer equipped with a Bluetooth RFID reader. Score data was sent to the server over a 3G data connection.

Solo and combo check-in

A fundamental mechanic in ZWERM was the check-in, which could be performed with one of the 1441 RFID cards that were distributed among different households in the 2 participating neighborhoods. The households were selected by walking through the neighborhoods and posting envelopes containing a RFID card and a leaflet explaining the goal and functioning of the system in every encountered letter box.

Check-ins were performed on 2 “Hollow trees”, placed at a physical location that was central to each neighborhood. These trees were 3 meters high and custom made for ZWERM. They contained a touch-enabled PC made for outdoor use, an RFID reader and a battery to power the PC and the RFID reader.

There were two types of check-ins. The solo check-in was performed by a single user and scored the player 10 points. The combo check-in was performed by two players from the same team who had never checked-in together during the current campaign and gained both players 50 points. The check-in mechanism with the RFID cards was simple and inclusive. It allowed people who did not own a PC, tablet or smartphone to participate in ZWERM. All they needed was their RFID card.

Figure 1: Left: a player performing a solo check-in on the Hollow tree. Middle: front of the ZWERM RFID card. Right: back of the ZWERM RFID card.

Sparrow whistle

Sparrow whistle points were earned by whistling to sensor devices attached to the facades of houses in the neighborhoods. 8 sparrows were distributed to neighborhood inhabitants that volunteered to hang them. The sparrows contained custom-made electronics and a sparrow-shaped casing. Every time a person whistled to one of the sparrows, the sparrow would light up in a different color combination and points would be scored for the neighborhood in which it was placed. The sparrows appeared as separate players in the leaderboards on which the players could see the game progress. Whistling to a sparrow therefore did not score points for the individual neighborhood inhabitant, but for the team as a whole.

Assignments

A third mechanic were the assignments. These could be performed by accessing the website[4] and existed in different types.

Wishes allowed people to post a wish and assign a reward to it. Each player started a campaign with a total number of 'wish credits'. By assigning a number of credits to the wish, this number would be deducted from the player's total number of wish credits. The amount of wish credits assigned to the wish set the reward that could be gained by fulfilling it.

Questions were a type of assignment that allowed players to answer a specific question asked by the neighborhood coaches, either through a multiple-choice answer or through an open, full text answer.

Geo Challenges allowed players to map points on a digital map of the area, as a response to a certain location-oriented question like 'what is the dirtiest spot in your neighborhood?'. The number of spots a player could map could be set in the Geo Challenge's settings. In addition, a peer-evaluation mechanism could be activated, requiring other players to validate the points that were added by their peers.

Events enabled players to score points by participating in a certain event. A mobile check-in method was created with an RFID card reader connected to an iPad tablet. A community coach, who checked that the requisite activity had been performed by the participant, operated the device and assigned the scores by swiping cards on the RFID reader.

Open assignments offered an easy way to extend the system with generic assignment descriptions. Where user actions in the other assignment types resulted in the automatic increase of player scores, this was not the case for open assignments. These required the community coach to manually (using the server's administrative back-end) add the correct number of points to the correct player when an open assignment was fulfilled. During the Ghent trials, open assignments were performed through Facebook. We created a ZWERM Facebook page[5], which gave us extra viral exposure to draw players to the game and a familiar place for players to express themselves. Example assignments were the posting of photos on Facebook according to a certain assignment description, like "Post an original way to check-in at the Hollow tree on Facebook". When players did this, the community coach would assign the correct number of points.

Dynamics

The game dynamics describe the way in which the mechanics bring about the aesthetics. They represent the behavior that is produced when players use the system's mechanics. This section explains how the mechanics produce the core ZWERM aesthetics of fellowship, challenge, pastime and expression. Some of these dynamics were anticipated, while others were not and can therefore be considered emergent.

Challenge

Scoring points and engaging in two different types of competition (team-based and individual) supported the challenge aesthetic. First, there was the competition at the team level. We observed a spike at the end of every campaign, when the two teams were racing for the victory, as shown in Figure 2. In the first

[4] http://zwermgent.be
[5] https://www.facebook.com/zwermgent

campaign, this effect was not very prominent, as the score line is relatively flat. However, from the second campaign on, a sharp increase in the number of points can be observed at the end of each campaign.

Longitudinal observations showed that a multiple times in the different campaigns, a successful coordinated effort was made by both teams to overtake the other team. To make the progress of the team apparent, the leaderboard was displayed in one local café on the screen where normally sports events can be followed. Figure 2 also shows that at the end of each campaign, the results of the previous campaign were surpassed, suggesting that the competitive challenge element in the system was successful and that ZWERM remained interesting enough to generate player activity until the last campaign. In the end, the trials ended in a draw, as each team won twice. This indicates that the concept and its amount of challenge were balanced. No team had a distinct advantage over the other and the game did not die out at any time during our trial.

To provide a small incentive, we told the players at the beginning of the trial that the winning team would get a prize of 500 Euro to spend on neighborhood incentives from the hands of the mayor, during the closing event. Our city of Ghent colleagues insisted that we reward both teams (also the losing one) anyway, so the fact that the game ended in a draw made this easier for us to explain this.

A second type of competition was at the level of the individual players. At the end of the campaign, the top player of each team received a 20 Euro gift certificate. Figure 3 shows the leaderboards that could be used to track one's position in the game with regard to other players.

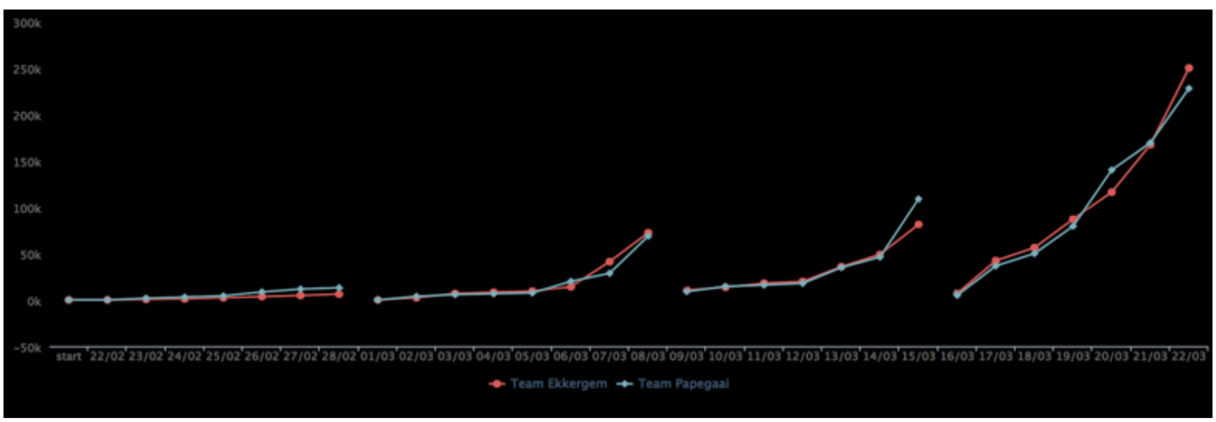

Figure 2: Day-by-day score evolution of the 4 different campaigns.

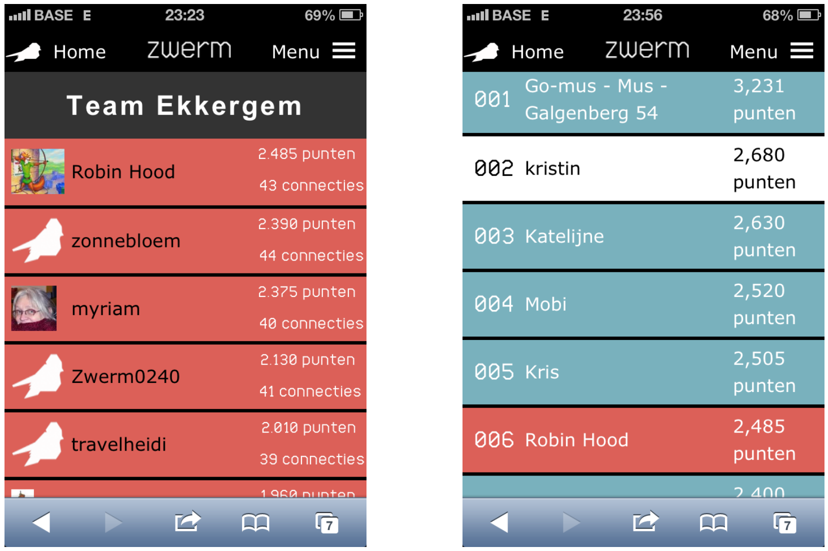

Figure 3: Leaderboards as seen on an iPhone. Left: Team Ekkergem leaderboard shows the score (called punten in Dutch) and the number of connections, created through combo check-ins (connecties in Dutch). Right: Overall leaderboard for the logged-in player. Blue players are of Team Papegaai, red players are of Team Ekkergem, white player is the currently logged-in player.

Fellowship

The check-in mechanism was the main driver of the fellowship aesthetic. We noticed that people self-organized to perform the highest possible number of points. In the first campaign, this was not so much the case, as people still had to discover much of the mechanics and possible dynamics. However, in the subsequent campaigns, there was a lot of self-organization taking place to have people check-in together.

The organizational dynamics varied across Teams. In Papegaai, there was a strong support for the project by one of the neighborhood inhabitants that also played a prominent role in other local initiatives. This person organized the check-in procedure in an almost formal matter, making people check-in with as many teammates as possible. One inhabitant, fluent in statistics, even took a day off work to organize the combo check-ins in such a way that the score would be maximized. In Ekkergem, there was less support from the people who usually play a leading role in local initiatives. The check-in dynamic was much more ad-hoc. A number of inhabitants took it upon themselves to find new players for the game and to organize check-in moments around Ekkergem's Hollow tree. In order to make the sub-zero temperatures more bearable and provide a cozy atmosphere, the players built tents, brought chairs and music, prepared and distributed soup and brought alcoholic beverages.

We noticed a sharp rise in the number of solo, but more interestingly, combo check-ins over the campaigns, as can be seen in Figure 4. Campaign 1 had 533 solo check-ins and 114 combo check-ins, while campaign 4 had 5733 solo and 4096 combo check-ins. This means that there were 10 times as many solo check-ins and 35 times as many combo check-ins at the end of the trial compared to the start. Apparently, players were a bit slower to discover the value of combo check-in than solo check-in, but once they discovered the mechanic, they used it profusely.

An interesting emergent behavior appeared in the third campaign. Some people became very much engaged in the game and started looking for extra RFID cards to check in with. This was done by several means. Door-to-door visits to neighbors were frequently made to either invite them to participate in the game or to lend their RFID card out. A box was placed in the local bakery with a note, asking people to place their RFID cards in the box. That way, multiple points could be scored by checking-in with RFID cards that did not actually belong any more to active players. Another emergent behavior was a player who attached his or her card to the tree with a note asking people to check-in with the card.

These types of behavior could have been called cheating if we would have set clearer rules. However, we chose not to set strict rules at the beginning of the game and to only offer a set of simple mechanics. As there were no rules, these could not be violated, so we decided not to take measures to block this type of behavior, but to react in a playful manner. In the case of the player who attached the card to the tree, we went to take the card and in the next campaign created an assignment based on geo caching in which we hid the card and offered a reward to the first player who found it. The card was found on the second day of that campaign.

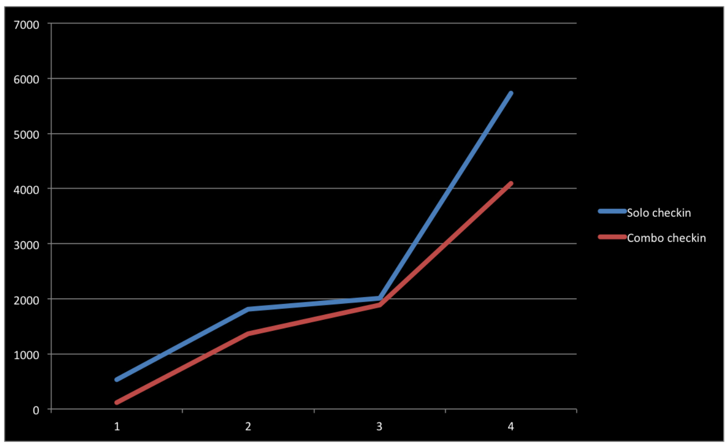

Figure 4: Number of solo and combo check-ins (y-axis) in the 4 different campaigns (x-axis)

Pastime

Pastime activities are the ones that you engage in when you have a little dead time on your hands. This is not what happens when playing a typical game, which takes a longer time to play. Check-ins proposed such a very brief activity. A player would for example pass by the tree while walking her dog and decide to check-in. This would take only a few seconds. The same is the case for the assignments. A player is waiting for the bus and decides to check if there are new assignments using his smartphone. A new question is visible on the mobile-optimized web-app and the player decides to answer the question, which only takes a very brief moment.

We believe that the pastime or casual nature of ZWERM was important to provide prolonged engagement and self-organizational outcomes. In a system that provides more intense gameplay over a shorter time, it would be harder to create self-organizational behavior, which takes time to emerge.

Expression

Many forms of expression were observed. One of the main manifestations of player expression was the way in which they participated in assignments. For example, there was an assignment in which people were asked to create posters with graphical ZWERM-related material. Community coaches would walk through the neighborhood and give players who had created posters points using the mobile check-in infrastructure.

Some Geo-Challenges showed us a glimpse of how the players see their neighborhoods (see Figure 5). This yielded highly relevant ‘points of interest’ (POI) that could for example be published as an insider’s guide to the participating neighborhoods of Ekkergem and Papegaai, indicating the nicest spots according to its inhabitants.

In another Geo-Challenge instance in campaign 2, we asked players to indicate the dirtiest spots in their neighborhood. We went to check if the indicate locations were indeed dirty and found this to be the case. This type of data could for example be used to organize more targeted community-led cleaning actions, which we did in campaign 3.

In campaign 2, we posted a Geo Challenge asking people to ‘Post the nicest facades in the neighborhood’. Until then, Geo Challenges had produced high-quality POIs. However, some players began to map POIs that were nonsensical in order to score large amounts of points. We decided to limit the number of POIs that a user could post per Geo Challenge for the further Geo Challenge assignments.

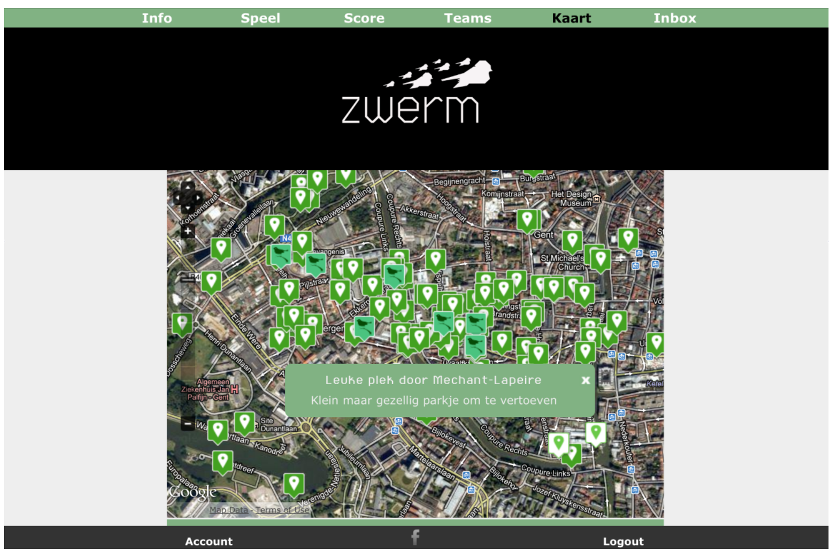

Figure 5: The result of the Geo-Challenge “indicate the nicest spots in your neighborhood”, which was a part of the first campaign.

ZWERM evaluation

Some results, related to the player dynamics of ZWERM, have been discussed above. However, there was a lot more data to be analyzed, as we collected qualitative data in the form of observations and interviews as well as quantitative data in the form of log and survey data. We discuss some of our findings in this section. These findings are only based on the quantitative data.

Server log data

In total, our logs show that 277 players participated in the game either by checking-in or by participating in the assignments. As we distributed 1441 cards, this means that we achieved a 19,2% participation rate.

Because the sparrows did not generate log data linked to a particular user, but to the neighborhood as a whole, it is not possible for us to evaluate how many different people whistled to the sparrows.

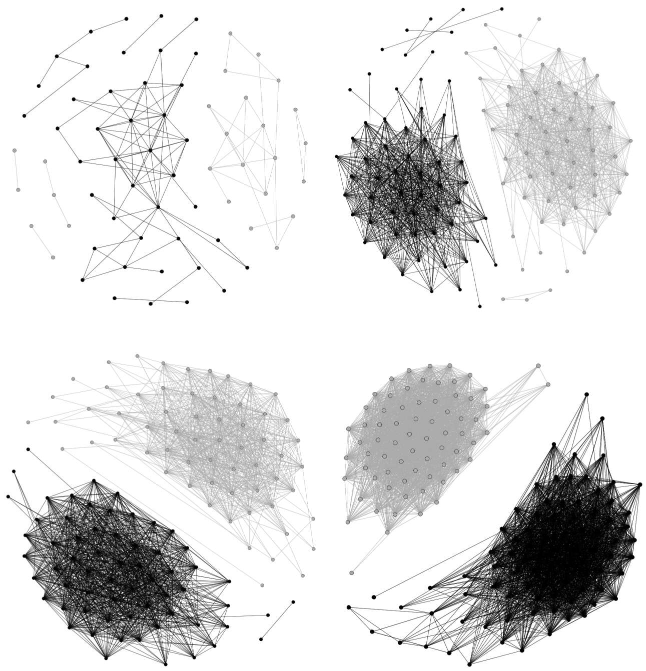

Figure 6: The social network formed by combo check-ins in campaign 1 (top left) to 4 (bottom right). Black nodes and edges are for Team Papegaai, gray nodes and edges are for Team Ekkergem.

In Figure 6, the social networks of the different campaigns are shown. What is apparent is that the number of nodes increases gradually. This is visible in Table I, which shows an increasing number of participating nodes representing players that have performed a combo check-in. The number more than doubled over the 4 weeks. In addition, there were a lot more combo check-ins between the players: 1,6 average connections per player for campaign 1; 26,2 connections per player for campaign 4.

Figure 6 and the "Number of connected clusters" column in Table I highlight how the difference between the two teams became more and more apparent as the ZWERM Ghent trials progressed. In the first campaign, there were 9 connected clusters in the network. The largest connected cluster belonged to Team Papegaai (black nodes and edges), which also won the campaign. The largest cluster for Team Ekkergem was smaller. As the game progressed, the two teams became more and more connected, until in campaign 4 there were only 2 connected clusters left. This indicated that increasingly, the participating neighborhood inhabitants started to act as a single team, checking-in together.

Campaign	Number of nodes	Average number of connections	Number of connected clusters
1	71	1,6055	9
2	117	11,624	6
3	125	15,112	3

4	156	26,2435	2

Table I: Social network evolution over the different campaigns

Survey data

About one fifth of the ZWERM players (n=55) filled out an online evaluation survey after the end of the game. The average age of the respondents was 34 years and respondents were equally divided over the two competing neighborhoods (49% Papegaai - 51% for Ekkergem). Respondents had lived an average of 8,5 years in their neighborhood.

In general, respondents evaluated the game positively. When we asked them whether the game had improved communication between people in the neighborhood or whether the game had improved the atmosphere in the neighborhood, respectively 91% and 86% of the respondents confirmed that this was indeed the case. Results showed that playing the ZWERM game became a daily routine for 73% of the respondents, stimulating a feeling of neighborhood cohesion (75%). In addition, on average players of ZWERM got to know 14 people from their neighborhood with whom they had not spoken before the introduction of the game in the neighborhood.

Figure 7 shows the results of the survey question "With how many people (with whom you had never spoken before) did you get in contact through ZWERM?". The chart shows the typical power-law distribution that has been observed in many other networks and social media. It indicates that a great number of people did not participate a lot, while a small number of players participated a great deal.

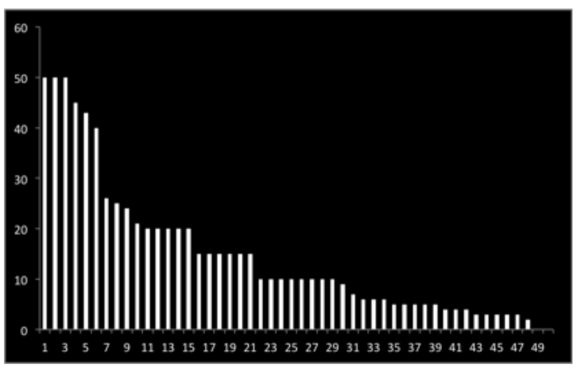

Figure 7: Number of connections (y-axis) per survey respondent (x-axis) ordered by declining number of connections

Failed mechanic: wishes

Almost no wishes were posted and no wish was granted. This may have been caused by an overly complex procedure for the posting and granting of a wish. This procedure was put in place to close a number of possible game exploit opportunities for the wish mechanic. However, we noticed in the pre-trials, which we conducted at our own research center, that it did not work there either. In this environment, as we where much closer to the players, we were able to explain the workings of the wish mechanic to people who did not at first understand it. But even in this situation, people did not post or grant wishes and the ones that were published were of a relatively futile nature. Although we have not gathered data on this, we believe this to be due to the fact that the reward for granting a wish was small and that this reward was nullified at the end of every campaign, when the scores were set back to zero. In addition, we believe the wish mechanic was just tot complex.

Discussion

We find that applications like ZWERM can be beneficial for the support of self-organization in urban neighborhoods. As was stated before, we use Heylighen et al's (in press) concept of mobilization systems to frame some requirements for social computing applications that support self-organization. Mobilization systems have two major dimensions that a system should address: motivation and coordination. These elements should be seen in the context of the goals of the mobilization system. In this case, the goal was the consolidation and activation of social capital in order to support self-organization. In Table II, we have indicated the different mechanics and how they helped us to achieve activation and consolidation of social capital through a mobilization system that supported motivation and coordination.

	Consolidation of social capital	Activation of social capital
Motivation	Score	Score
Coordination	Check-ins	Assignments

Table II: Mechanics as they are related to the goals of the SCA and the way in which they provide mobilization system functionality.

The score mechanic is instrumental to motivation and is one of the main mechanics advanced by the gamification literature together with collectible badges. We have noticed that it is indeed an effective mechanism to motivate players to participate more in the system. This was for example apparent in the way in which the activity of the game rose very steeply at the end of each campaign, on Thursday and Friday, as discussed before. However, scoring points was not the only motivation for playing the game. From observations and interviews, we learned that players were also motivated by the sense of social connectedness that came from checking-in and from the feeling that they were doing something useful for the neighborhood. However, we still need to further analyze this type of data.

Check-ins contributed to the consolidation of social capital through coordination. This provided a mechanic that stimulated people to score points by finding others with whom they had not checked-in before. In this way, the system got extra exposure and attained a viral effect that led players to actively search new players and encouraged them to participate. This led to some interesting appropriation behavior, like the collection of RFID cards at the local bakery and the regular organization of check-in parties after dark and by sub-zero temperatures.

Assignments provided a way to activate social capital and coordinate people's communal actions. It is the aspect of ZWERM that is most promising to the stimulation of self-organization. One interesting possible way to approach this is to use the questions to gather ideas that can be used to shape future campaigns. For example, ideas can be gathered in one campaign on what events to organize in the next campaign. Up and down voting, a feature that has not been included yet, but that has proven its value in SCA's like StackExchange, could determine the most popular idea and automatically retain the event for organization in the next campaign.

In terms of self-organization, it is important that future work should address the different roles in the system. Especially the role of community manager is instrumental to establishing self-organization in neighborhoods. People who are close to the community, yet are neutral should play this role. This neutral role is important to ZWERM, as it is necessary to add content to the system that is the same for all the participating neighborhoods. If this is not the case and the community coaches are too partial towards a particular neighborhood, there could be an imbalance in how hard it is to score points for each team. Still, the community coaches need to be close to the community and stimulate the production of content that supports the emergence of self-organization.

Thus, the current role of community coach is a contradictory one. The coach has to be close to the community, yet impartial to the participating teams. To address this contradiction and based on what we learned during the Ghent trials, we propose to investigate the new role of community leader. During the campaigns, we have clearly seen some people evolve from observers to very active players taking initiative and leading the effort of the community, in a way that is in line with the reader-to-leader community evolution model presented by Preece and Shneiderman (2009). These were players performing a ‘community leader’ role.

This role could be formally attributed in a new campaign to the person who was most socially active in the previous campaign. The community leader’s role would be to lead the effort in the active campaign, but also to gather content on the content of the next campaign. Suggestions for this content would then be passed on to the community coach, who would decide what to implement. This decision would be taken while taking into account a balanced experience for all the participating teams. A community leader could improve the self-organizational capacity of ZWERM. Changing the community leader between campaigns may be an interesting way to change the way dynamics are flowing from the existing mechanics. For example, a new community leader may propose new ways of performing combo check-ins. On the other hand, formalizing the role of community leader could stifle the more emergent leadership effects that we witnessed in the Ghent trial. We see this as an interesting issue to further investigate.

In general, we believe a SCA mobilization system like ZWERM can be applied to other social contexts. Here, we applied it to social capital in urban neighborhoods to stimulate self-organization, but other social contexts where social capital can benefit from consolidation and activation will be further investigated. We would like to find out if this type of system could for example be beneficial to larger organizations. Such organizations spend resources on team-building activities to get people to know each other better. A SCA mobilization system such as ZWERM could provide a prolonged experience allowing this to happen. Another possible area of application is events like conferences, where strangers come together. Such events could often benefit from the social lubrication provided by a ZWERM-like system. Finally, we believe that such a system could also be applied in schools. Pupils could check-in on a tree for fun part and to get to know other pupils, while being served educational content trough the assignments.

Conclusion

We have described ZWERM, a social computing application acting as a mobilization system. The system provided ways to motivate and coordinate players’ activity in such a way that social capital was consolidated and activated. We have use the MDAG framework to describe the workings of ZWERM.

The main aesthetics we have worked with were challenge, fellowship, pastime and expression. These aesthetics were produced by the mechanics of score, solo and combo check-in, sparrow whistles and assignments. The ZWERM trial was overall evaluated by participants as positive and as contributing to the social cohesion in the neighborhood. A number of instances of self-organization at the level of the neighborhood ensued. We see possible application of the ZWERM concept to other social contexts that can benefit from the consolidation and activation of social capital.

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